WSBW B.E. Notebook

United States Department of Agriculture
Forest Service
Region 3
517 Gold Avenue, SW
Albuquerque, NM 87102

3430 Evaluation

Date: NOV 22 1983

Subject: Forest Pest Conditions on Taos Pueblo Lands

To: Area Director
Bureau of Indian Affairs
Albuquerque Area Office
P.O. Box 8327
Albuquerque, NM 87198

At the request of Bureau of Indian Affairs (BIA), Jim Linnane and Ed Wood, Forest Pest Management, performed a brief field evaluation of forest pest conditions on Taos Pueblo lands. The field data referred to in this evaluation were collected during August 8-11, 1983, with the able assistance of Fernando Abeita, Lloyd Cummings, and Wayne Waquiu, plus two forestry technicians, BIA.

The original intent of this evaluation was to appraise the western spruce budworm (WSBW), Choristoneura occidentalis Free., situation on the pueblo. This insect has been causing significant problems on pueblo lands and adjacent Carson National Forest and private lands since 1976. However, the same lands have had a history of dwarf mistletoe problems; hence, an evaluation of this situation seemed necessary as well.

First, we will discuss the WSBW. This insect causes tree mortality, top-kill, and growth loss by annually defoliating the new growth of its hosts. In New Mexico, the budworm's principal hosts are Douglas-fir, Pseudotsuga menziesii (Mirb.) Franco, and white fir, Abies concolor (Gord. and Glend.) Lindl. These tree species are principal components of the mixed conifer forest type which comprises a substantial portion of pueblo lands. Defoliation results from larval feeding during the months of June and early July. Since the feeding is generally confined to the new growth, several years are required before damage becomes significant. This budworm is a native insect and is always present in an endemic state. Tree damage occurs when the insect reaches epidemic levels, such as the recent situation in northern New Mexico. These epidemics vary in duration; past epidemics have lasted from 5 to 15 years.

Forest Pest Management uses two techniques to evaluate the WSBW--aerial detection surveys and egg mass surveys. Aerial detection surveys in both 1982 and 1983 have shown a decline in acreage defoliated by the budworm. In 1983, approximately 3,800 acres were defoliated. This figure is down dramatically from the 32,700 acres defoliated in 1981.

An egg mass survey is a technique to estimate budworm egg mass densities on host trees. From this density estimate, predictions can be made on the severity of next year's defoliation. A sequential sampling method developed by McKnight[1] was used to estimate egg mass density and predict subsequent defoliation for this evaluation. This method requires that two 24-inch branches be pruned from the midcrown of a minimum of 25 host trees in the area being evaluated. These samples are bagged, labeled, and transported to a laboratory, where the new egg masses are counted.

On the pueblo, 33 trees were sampled in the largest area visibly defoliated (map enclosed). From these samples, a total of 274 new egg masses were discovered, for an average of 4.1 egg masses per branch. According to McKnight, this egg mass density will result in light defoliation (5-35% of the new growth) in 1984.

The stands sampled were, generally, lightly defoliated in 1983. However, defoliation from previous years has resulted in small amounts of tree mortality and top-kill. The understory (trees <5 inches d.b.h.) was severely damaged by budworm in many locations. The principal impact on the pueblo appears to be understory mortality, growth losses, and top-kill. A high percentage of the overstory has survived the recent years' defoliation. No other significant insect problems were observed.

These mixed conifer stands are not only defoliated by the WSBW, but are also infected by dwarf mistletoe. Two dwarf mistletoe species are present in stands evaluated. Douglas-fir dwarf mistletoe (DFDM) (Arceuthobium douglasii) is general throughout the area on Douglas-fir. Southwestern dwarf mistletoe (SWDM), A. vaginatum subsp. cryptopodum, was found on ponderosa pine in one mixed conifer stand.

Dwarf mistletoes are plants which obtain all the minerals and water, and most, if not all, of the nutrients necessary for their survival and growth from the host tree. The resulting drain on the hosts' resources causes a reduction in growth which increases as the infection rate increases. In addition, infected branches appropriate more than their share of nutrients, taking them from other parts of the tree and resulting in swollen, distorted branches and witches' brooms. The stresses on heavily infected host trees can kill them outright, or, as often happens, predisposes them to attack by bark beetles, with the same end result.

Dwarf mistletoes spread within the crowns of infected trees, and between trees, by means of small seeds which are forcibly ejected and which can travel as much as 60 feet. Spread is relatively slow, about 1 to 2 feet per year, through an even-aged stand, but is much faster from an infected overstory to an understory.

DFDM and SWDM are essentially host specific in the area examined; DFDM infects only Douglas-fir, while SWDM infects only ponderosa pine. Other conifer species, such as white fir and spruce, and hardwoods, such as Gambel oak and aspen, can be grown in these stands with no risk of infection.

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[1]McKnight, M. E., et al. 1970. Sequential plan for western spruce budworm egg mass surveys in the central and southern Rocky Mountains. USDA Forest Serv., Rocky Mountain and Range Experiment Station Res. Note RM-174. 8 pp.

trees infected with dwarf mistletoe are rated using the 6-class system (description enclosed). This dwarf mistletoe rating (DMR) is used to quantify the infection intensity in individual trees: 0 = uninfected, 1-2 = slightly infected, 3-4 = medium, and 5-6 = heavy infection. Generally, the deleterious effects of the dwarf mistletoe increase as the rating increases. This system is also used to rate infected stands and groups of infected trees. Stands are given a "mean DMR" ($\overline{DMR}$), which is a measure of the amount of dwarf mistletoe in the stand or how many trees are infected. Groups of infected trees are rated by their "average DMR" (Av. DMR), which is the average rating of only the infected trees and gives a measure of the severity of the infection in the stand.

We collected information in two mixed conifer stands, and examined and discussed two others (map enclosed). Stand 1 was located in the SW¼ of the SE¼ of sec. 5 at the road switchbacks. The overstory (12"+ d.b.h.) was about evenly distributed among four species; ponderosa pine, white fir, spruce, and Douglas-fir. Infection rate with Douglas-fir is 100 percent, with an average DMR of 6. The pole and sapling component of the understory consists primarily of Douglas-firs and white firs, with a few scattered spruces and ponderosa pines. Seedling-sized trees are almost entirely white firs, aspens, and Gambel oaks. The understory Douglas-firs in close proximity to infected overstory trees are infected, but, overall, the infection rate is low. It appears that most of the Douglas-firs within range of DFDM seeds produced in overstory trees have already died. This stand is now well stocked by species resistant to DFDM. The main effect of the parasite was, and will continue to be, to reduce the Douglas-fir component while leaving the stocking of other species at a high level.

Stand 2. This stand is located in the SE¼ of the SE¼ of sec. 5 between La Junta Creek and the road. Both overstory and understory are 60 to 70 percent Douglas-fir, the rest being white firs and a few ponderosa pines, none of which were sampled on the prism plots. This stand has been cut. As a result, the overstory is now composed of small sawtimber which averages 14 inches d.b.h. The Douglas-firs are heavily infected by DFDM, with a $\overline{DMR}$ of 3, and an average DMR of over 4. The Douglas-fir understory is also badly infected, with a $\overline{DMR}$ of 3.6, and an average DMR of about 4.

Dwarf mistletoe and WSBW have been operating in this stand for many years, and the Douglas-firs are showing the effects of the pests. The high average DMR indicates that both overstory and understory Douglas-firs will die over the next 20 to 30 years, leaving scattered white firs, which are defoliated by WSBW. Although white fir will continue to occupy the site, understory aspens will respond to increased light and will constitute a large component of the stand. The large numbers of snags created over a relatively short time may increase fuels to undesirable levels and increase the chance of a catastrophic fire.

Stand 3. This stand is located on a northwest-facing slope in the NW¼ of the SE¼ of sec. 5. The overstory is almost entirely Douglas-fir sawtimber, with a very few scattered ponderosa pines and white firs. The sapling understory is primarily Douglas-fir, with some white pine and a few aspens present. WSBW has been active in this stand for a number of years. DFDM infection levels were estimated to be higher in both stories than in stand 2; most of the understory trees died, apparently from the combined effects of WSBW and DFDM. Large areas

re understocked and there are many fallen snags, creating a hazardous fuel situation. The only healthy trees in much of the stand are the few scattered ponderosa and white pines. We feel that the appearance of this stand is similar to the present or future appearance of many of the DFDM-infected stands on the reservation which have a large Douglas-fir component.

Stand 4. This stand is located in the SW¼ of the SW¼ of sec. 6, about 20 chains northwest of the pond on Deer Creek. It is located on the top and upper slopes of a flat ridge and consists of a Douglas-fir and white fir understory and overstory. WSBW has defoliated both species for several years. The Douglas-fir is heavily infected by DFDM. The prognosis for this stand would be similar to the other three, in that Douglas-fir would gradually be eliminated from the stand, to be replaced by white fir and aspen, except for the presence of two root disease organisms. This stand contains a number of areas characteristic of both annosus root rot and shoestring root rot. Limited excavation and dissection revealed decay caused by both organisms, fruiting bodies of Fomes annosus, the cause of annosus root rot, and mycelial fans characteristic of Armillariella mellea, the cause of shoestring root rot. Annosus root rot was in white fir stumps and trees, and shoestring root rot was found in Douglas-firs weakened by WSBW and DFDM. Both of these fungi utilize stumps and snags, and spread from them to adjacent live trees. The fungi are able to live in the root systems of dead trees for as long as 40 years, preventing the establishment of susceptible species. As a result, this stand will be badly understocked for many years, with large amounts of heavy fuels on the ground, until aspen gradually becomes established.

The stands examined obviously suffer considerably from insect and disease problems and are fairly representative of mixed conifer sites on the pueblo. For the WSBW, management alternatives are "no action" and suppression with insecticides. While this insect is still present on pueblo lands, current field data indicate its populations are in a decline. As a result, suppression is not biologically a viable alternative at this time. We recommend no action be taken against this pest. For the disease problems, principally dwarf mistletoe, management of this pest is possible through intensive silvicultural practices. Such a program would require a reevaluation of management objectives for these lands, strongly considering the economics of mistletoe suppression. While the insect and disease situation is generally unfavorable, this does not mean the forest will cease to exist in the near future. It does mean the timber productivity from these stands will be reduced as a result of pest actions. Other resource values, such as wildlife, water, and esthetics, will not be greatly affected by these pests. Hence, the objectives of these forest lands should be fully considered before embarking on any pest suppression program.

If we can be of further assistance, please contact us.

Douglas L. Parker

DOUGLAS L. PARKER
Director of Forest Pest Management

Enclosures (2)

c:
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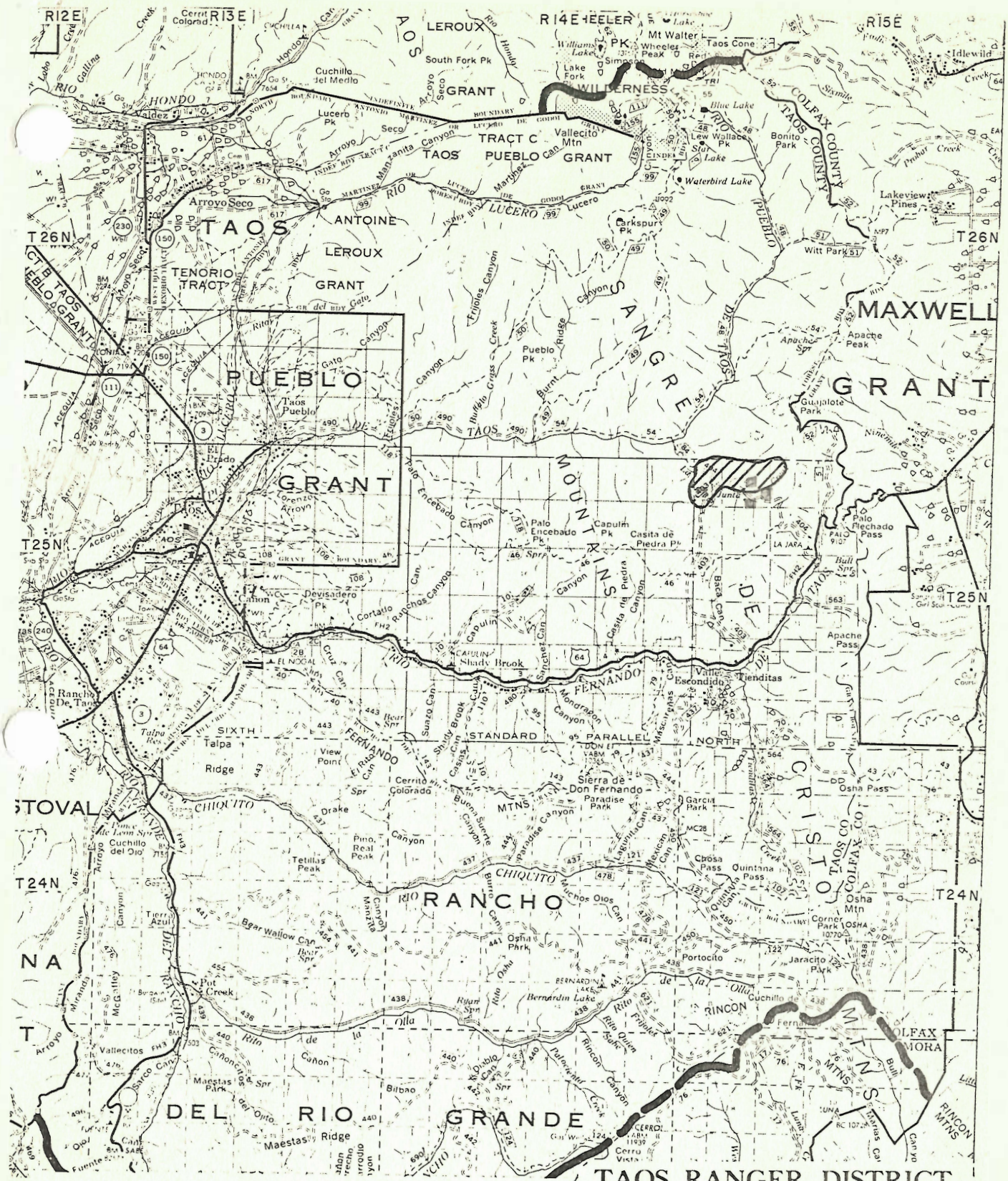
RM



1983 Taos Pueblo Evaluation

Legend

(III) Area sampled for western spruce budworm

▪ Stands evaluated for dwarf mistletoe

TAOS RANGER DISTRICT

CARSON NATIONAL FOREST

NEW MEXICO

1969

Scale

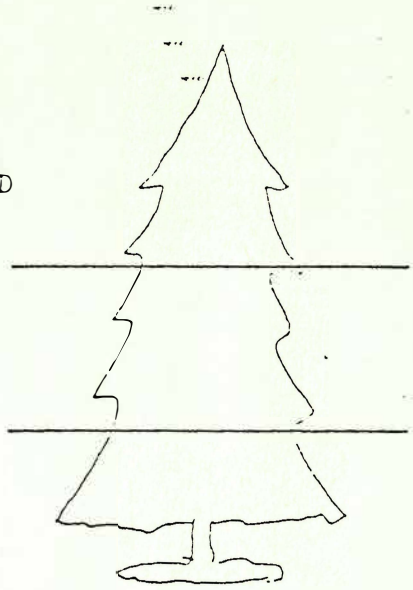
1 ½ 0 1 2 3 4 5 Miles

LEGEND

Ranger District Boundary

National Forest Land

INSTRUCTIONS



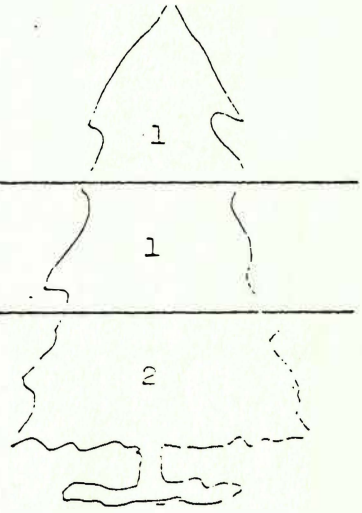
STEP 1: DIVIDE LIVE CROWN INTO THIRDS.

STEP 2: RATE EACH THIRD SEPARATELY. EACH THIRD SHOULD BE GIVEN A RATING OF EITHER 0, 1, OR 2 AS DESCRIBED BELOW.

(0) No visible infections
(1) Light infection ($\frac{1}{2}$ or less of total number of branches in the third infected)
(2) Heavy infection (more than $\frac{1}{2}$ of total number of branches in the third infected)

STEP 3: ADD RATINGS OF THIRDS TO OBTAIN RATING FOR TOTAL TREE.

EXAMPLE



If this third is lightly infected, its rating is (1)

If this third is lightly infected, its rating is (1)

If this third is heavily infected, its rating is (2)

AND THE TREE, IN THIS EXAMPLE, WILL RECEIVE A RATING OF 4 (class 4 tree)

(1) + (1) + (2) = 4

6-Class Dwarf Mistletoe Rating System